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Distribution and population density forest dormouse (*Dryomys nitedula,* Rodentia, Gliridae) in a region of the Middle Volga, Russia

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ABSTRACT

Populations of the forest dormouse (*Dryomys nitedula*, Pallas 1778) are widespread across Europe and south-western Asia, but their population density near human homes has is insufficient, and extremely scarce in the Russia. We studied population density of the forest dormouse in the Middle Volga, where forest dormice in 2013-2019 were recorded in 30% of investigated biotopes, being 4–70 ha in size. In Mordovia, the average densities of the local population were 2.4 ind./ha. The abundance of the local population was stable, and the sex ratio was approaching 1:1 among all individuals. One-year-old dormice comprised more than 50% of the population. Our data indicate that the home area of forest dormouse near human houses is within a radius of less than 100 m from the houses. This data is less than for the forest. This indicates that the animals next to humans artificially reduce their home area, as they are fully provided with food resources.

Key words : *Forest dormouse, Population density, Human settlements, Middle Volga*

Introduction

Populations of the forest dormouse are widespread across Europe and south-western Asia (Kryštufek and Vohralik, 1994; Rossolimo *et al.,* 2001; Batsaikhan *et al.,* 2008; Juškaitis, 2015). Their population density and distribution are known insufficiently near people's homes. Forest dormice are mostly nocturnal (Bisconti *et al.,* 2018). Most of them are forest inhabitants, preferring deciduous and mixed forests (Nowakowski and Boratyñski, 1997; Rossolimo *et al.,* 2001). They use holes and hiding places under roots and fallen tree trunks as shelters, sometimes build nests in the branches of trees (Scinski and Borowski, 2006). Forest dormice eat insects and other invertebrates, sometimes eggs, chicks and small birds (Juškaitis and Baltrûnaitë, 2013), also actively use plant food, primarily fruits and seeds of forest plants (Rossolimo *et al.,* 2001).

All species of dormice are closely related in their life with numerous species of trees and shrubs (Airapetyants, 1983). Therefore, researchers often conduct work in the natural environment. However, it is very important to study the settlements of forest dormouse near people's homes. There is a difference in their population density? Such settlements are known very few. This is the novelty and value of this article. The aim of this research paper was to study the population density near people's homes in a region of the Middle Volga. Previously, we studied various features of species biology and ecology in the vicinity the biological station of the Mordovian University (Grigorieva *et al.,* 2015; Andreychev and Boyarova, 2020; Andreychev and Kiyaykina, 2020).

Materials and Methods

The Republic of Mordovia (26,200 km^2) is located in the Middle Volga (centre of the European part of Russia). The climate of the region is moderate with pronounced seasons throughout the year. The influx of direct solar radiation in Mordovia varies from 5.0 in December to 58.6 kJ / cm^2 in June. Total radiation throughout the year is 363.8 kJ / cm^2; the radiation balance is 92.1 kJ / cm^2. The average annual air temperature varies from 3.5 to 4.0 °C. The average temperature of the coldest month (January) is in the range of –11.5 to –12.3 °C. Temperature drops down to –47 °C occur. The average temperature of the warmest month, i.e. July, is in the range of +18.9 to+19.8 °C. Extreme temperatures in the summer reach 37 °C. The average annual precipitation in the territory of Mordovia is 480 mm. Over the course of observation lasting many years, periods of more and less humidification were noted, ranging between the minimum and maximum values of 120 to 180 mm. Distribution of precipitation across the territory is not very diverse. The average long-term value of evaporation is calculated to be in the range of 390 to 460 mm (Yamashkin, 1998).

The biological station of the Mordovian University (Figure 1) is located in the Sura floodplain south of the village of Simkino in Bolsheberezhnikovsky district. In this section of the Sura River, a solid array of forests with a high diversity of plant communities stretches along its left bank. Different types of forests are represented: dune pine forests, floodplain oak forests, aspen forests, birch forests; as well as floodplain meadows, lowland and transitional swamps. The study was conducted between 2013 and 2019 in the forest territory, about 310 km^2 large, at the Middle Volga (Left Bank Prisurie, Sura River - the right bank of the Volga River), where the biological station of the Mordovian University is located. Twenty-nine people's homes are located on the biological station, cordon and children's camp. Forest dormouse lives here near the houses and in the homes of people. During the snowless period of the year, people live in these houses. The forest dormouse is not afraid of people. Eleven forest stands were surveyed in this study (size range 4–70 ha). All of them were adjacent to people's homes.

In Mordovia, mammals are studied using various research methods: trapping with traps lines (Andreychev, 2020), portable voice recorders (Andreychev, 2018, 2019, 2019a; Andreychev *et al.*, 2020), analyzing of osteological material from the pellets of predatory birds (Andreychev *et al.*, 2014, 2016; Andreychev and Lapshin, 2017), and others. The most suitable method for studying the forest dormice in our conditions is catching with the help of live trapped. We used four trap lines with 25 live traps in the line (Fig. 2). Traps were baited with salami and apple. One trapping session lasted 5 days. Trapping effort varied significantly between years (3–16 trapping sessions per year). We standardise this by calculating number of dormice caught per 100 trap nights (TN). The population density of forest dormouse is also determined by the number of tagged individuals in a certain area. With high probability, all animals living there are regis-

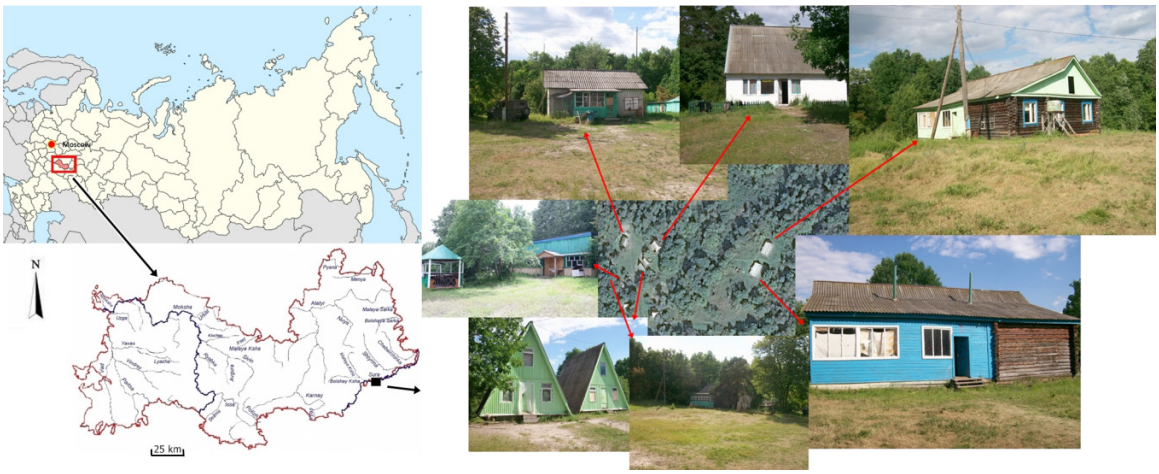

Fig. 1. Geographical position of the biological station Mordovian University (black square) and of the Republic of Mordovia (53° 38′ – 55° 11′ N; 42° 11′ – 46° 45′ E) in Russia. Note: red arrows - houses near which the was caught animals.

tered.

To determine the size of forest dormouse habitats, we used earlier homing experiments. Some of the captured individuals (47) were released at different distances from their habitats (Andreychev and Kiyaykina, 2020). The following marks were selected: 50 m, 100 m, 200 m, 300 m, 500 m, 1 km, 2 km, 3 km, 4 km, 5 km, 6 km, 7 km, 8 km, 9 km, 10 km. Issues were carried out in different directions. Caught and tagged animals were moved to places of release in opaque containers. Fifty-seven pilot issues were conducted. The live traps in which forest dormouse were initially found, after their removal, remained wary in the same places. The expected return probability for a random search was calculated using the Furrer formula (Furrer, 1973): $2\text{asin}(R/d)/\pi$, where R is the radius of the familiar space and d is the distance of movement.

Results

In 2013–2019, 112 forest dormice were trapped in 2100 trap nights in the territory of Biological station of the Mordovian University. The population density estimate was average < 20 dormice per 100 trap nights. In Mordovia, the average densities of the local population were 2.4 ind./ha. The abundance of the local population was stable, and the sex ratio was approaching 1:1 among all individuals. By age, the forest dormouse population is divided into four groups. One-year-old dormice comprised more than 50% of the population, while 2-, 3-, and 4-year-olds decreased sequentially. Animals wintering four year make up a small part of the population. All of them die during the fourth summer of life. 27.7% of individuals from all captured individuals were immature. Weight of males: 14 - 40 g, M = 23.6 g. Weight of females: 14 - 37 g, M = 24.3 g.

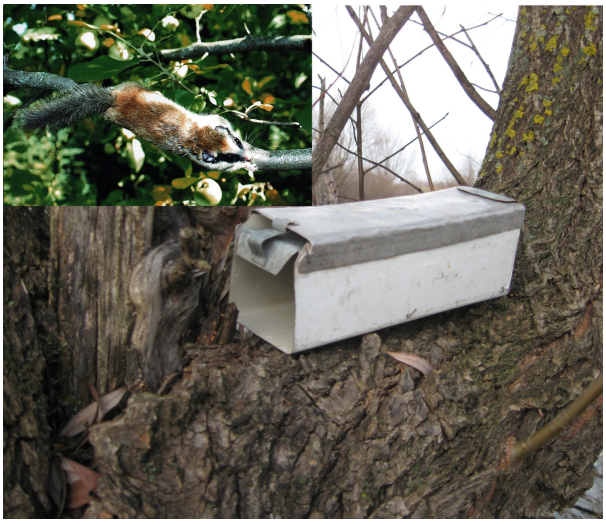

Fig. 2. Method of catching forest dormice using live traps.

In experiments on the study of homing, it was found that the probability of a return remains from a distance of up to 5 km. Over 5 km of returns, dormouse has not been received. The absence time at the place of seizure was several days when moving to a distance of up to 100 m, about a week - to a distance of up to 1000 m. The time of absence began to increase exponentially after moving to a distance of more than 1 km. The drop in homecoming success with increasing distance was in line with what was expected for a random move. However, if for short distances this corresponds to the expectation for R = 300 m, then for long distances - for R = 800 m. Thus, we can conclude that the forest dormouse has largely settled on the territory of the biological station. The home area in the radius is about 50-100 m, and the familiar space of the individual is not less than 300 m.

Discussion

As shown by our result, the population density is quite high near people's homes. We compared our data with many results on the population density of forest dormouse from the natural environment (forest). For example, in Northern Moravia, population density was estimated at 0.1 ind./ha (Gaisler *et al.*, 1977). In Moldova, the population density was estimated at 8-9 ind./ha (Uspensky and Lozan, 1961). In Armenia - 15-18 ind./ha (Gazaryan, 1985). In Western Mongolia, 20 ind./ha (Stubbe and Dawaa, 1985). In Lithuania 0.5 adults/ha (Juškaitis 2015; Juškaitis *et al.*, 2015). In Central Ukraine 0.1-0.4 adults/ha (Lozan *et al.*, 1990). In the Polish part of the Bialowieza forest 0.3 ind./ha (Nowakowski and Boratyński, 2001). In the Bialowieza Primeval Forest (NE Poland) population density ranged from 1.4 to 18.6 ind. × 10 ha^{-1}. Male home range area was larger (4.2 ha) than home range areas of females (0.75 and 0.73 ha) (Scinski and Borowski, 2006).

As for the sexual and age population of forest dormouse near people's homes in Mordovia and forest biotopes, it does not exist. Comparison was made with Bialowieza forest (Poland), Voronezh Reserve (Russia), Lithuania (Golodushko and Padutov, 1961; Angermann, 1963; Rossolimo *et al.*,

2001; Juškaitis, 2015; Juškaitis *et al.,* 2015). Everywhere, the sex ratio is close to 1:1 or slightly shifted towards the females. According to the age composition of the population, individuals who survive 1-2 wintering prevail everywhere. They form the core of the population. In Lithuania, the abundance of the local population was stable, and the sex ratio was approaching 1:1 among adult individuals, except in the first years of the study when abundance was higher than usual and the sex ratio was female-biased. One-year-old dormice comprised about 49% of the population, while 2-, 3-, and 4-year-olds and older accounted for 24%, 14% and 13%, respectively (Juškaitis, 2015).

Our data indicate that the home area of forest dormouse near people's homes is within a radius of less than 100 m from the houses. These figures are less than for the forest, where the radius of an individual site in Bialowie¿a forest is 150-300 m (Golodushko, 1959). This indicates that the animals next to people's artificially reduce their home area, as they are fully provided with food resources.

There is no opportunity to compare the population density of forest dormouse near people's homes in Mordovia with similar data for other regions. Since such studies are not known in the literature. In the literature it was only known that forest dormouse can settle in the hives, under the skin of houses, under the eaves (Airapetyants, 1983). Therefore, our study opens up new data on the possible high density of forest dormouse near people's homes.

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References

Airapetyants, A.E. 1983. *Dormice*. Publisher: Leningrad. Univ. Press, Leningrad, USSR, 191.

Andreychev, A.V. 2018. A new methodology for studying the activity of underground mammals. *Biology Bulletin*. 45: 937–943. DOI: 10.1134/S1062359018080022.

Andreychev, A.V. 2019. Daily and seasonal feeding activity of the greater mole-rat (*Spalax microphtalmus*, Rodentia, Spalacidae). *Biology Bulletin*. 46 : 1172–1181. DOI: 10.1134/S1062359019090012.

Andreychev, A. 2019a. New methods for studying the activity of semiaquatic mammals. *Periodico Tche Quimica*. 16 : 27-33.

Andreychev, A. 2020. Proportion faunal assemblage of rodents in geoecological districts of Mordovia, Russia. *Biodiversitas.* 21(9): 3961–3968. DOI: 10.13057/biodiv/d210906.

Andreychev, A. and Boyarova, E. 2020. Forest dormouse (*Dryomys nitedula*, Rodentia, Gliridae) – a highly contagious rodent in relation to zoonotic diseases. *Forestry Ideas.* 26 (1) : 262–269.

Andreychev, A.V. and Kiyaykina, O.S. 2020. Homing in the forest dormouse (*Dryomys nitedula*, Rodentia, Gliridae). *Zoologicheskii Zhurnal*. 99 (6) : 698–705. DOI: 10.31857/S0044513420060033.

Andreychev, A., Kuznetsov, V., Lapshin, A. and Alpeev, M. 2020. Activity of the Russian desman *Desmana moschata* (Talpidae, Insectivora) in its burrow. *Therya* 11(2): 161–167. DOI: 10.12933/therya-20-801.

Andreychev, A.V. and Lapshin, A.S. 2017. Quantitative and qualitative composition of diet of the Ural owl, *Strix uralensi* (Strigidae, Strigiformes), in the central part of European Russia (the example of the Republic of Mordovia). *Vestnik Zoologii.* 51(5) : 421–428. DOI: 10.1515/vzoo-2017-0050.

Andreychev, A.V., Lapshin, A.S. and Kuznetsov, V.A. 2014. Food spectrum of the Eagle Owl (*Bubo bubo*) in the Republic of Mordovia. *Zoologicheskii Zhurnal.* 93(2): 248–258. DOI: 10.7868/S0044513414020032.

Andreychev, A.V., Lapshin, A.S. and Kuznetsov, V.A. 2016. Breeding success of the Eurasian Eagle Owl (*Bubo bubo*) and rodent population dynamics. *Biology Bulletin*. 43(8): 851–861. DOI: 10.1134/S1062359016080045.

Angermann, R. 1963. Zur Ökologie und Biologie des Baumschläfers, *Dryomys nitedula* (Pallas, 1779) in der Waldsteppenzone. *Acta Theriologica.* 7: 333–367.

Batsaikhan, N., Kryštufek, B., Amori, G. and Yigit, N. 2008. *Dryomys nitedula*. IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. Available at: www.iucnredlist.org.

Bisconti, R., Aloise, G., Siclari, A., Fava, V., Provenzano, M., Arduino, P., Chiocchio, A., Nascetti, G. and Canestrelli, D. 2018. Forest dormouse (*Dryomys nitedula*) populations in southern Italy belong to a deeply divergent evolutionary lineage: implications for taxonomy and conservation. *Hystrix.* 29(1) : 75–79. DOI: 10.4404/hystrix-00023-2017.

Furrer, R.K. 1973. Homing of *Peromyscus maniculatus* in the Channelled Scablands of East–Central Washington. *Journal of Mammalogy*. 54 (2): 466–482.

Gaisler, J., Holas, V. and Homolka, M. 1977. Ecology and reproduction of Gliridae (Mammalia) in Northern Moravia. *Folia Zoologica.* 26 (2) : 213–228.

Gazaryan, M.A. 1985. On some questions of life history of the forest dormouse (*Dryomys nitedula* Pall.).

Izvestiya Selsko-Chozyaistvennyx Nauk Armyanskoi SSR. 7 : 40–44.

Goloushko, B.Z. 1959. Materials on the ringing of forest dormice in the reserve Bia³owie¿a forest. Migration of animals. Moscow, USSR, 186–189.

Golodushko, B.Z. and Padutov, E.E. 1961. Materials on ecology of the forest dormouse of the Bia³owie¿a forest. Fauna and ecology of terrestrial vertebrates of Belorussia. Izdatel'stvo Ministerstva vysshego, srednego i professional'nogo obrazovaniya BSSR, Minsk, USSR, 49–70.

Grigoryeva, O., Balakirev, A., Orlov, V., Krivonogov, D., Stakheev, V. and Andreychev A. 2015. Philogeography of the forest dormouse *Dryomys nitedula* (Gliridae, Rodentia) in Russian Plain and the Caucasus. *Folia Zoologica*. 64(4): 361–364. DOI: 10.25225/fozo.v64.i4.a12.2015.

Juškaitis, R. 2015. Ecology of the forest dormouse *Dryomys nitedula* (Pallas 1778) on the north-western edge of its distributional range. *Mammalia.* 79 (1) : 33–42. DOI: 10.1515/mammalia-2013-0165.

Juškaitis, R. and Baltrûnaitë, L. 2013. Seasonal variability in the diet of the forest dormouse, *Dryomys nitedula*, on the north-western edge of its distributional range. *Folia Zoologica*. 62(4) : 311–318.

Juškaitis, R., Balèiauskas, L., Baltrûnaitë, L. and Augutë, V. 2015. Dormouse (Gliridae) populations on the northern periphery of their distributional ranges: a review. *Folia Zoologica*. 64 (4) : 302–309. DOI: 10.25225/fozo.v64.i4.a2.2015.

Kryštufek, B. and Vohralik, V. 1994. Distribution of the forest dormouse *Dryomys nitedula* (Pallas, 1779) (Rodentia, Myoxidae) in Europe. *Mammal Review*. 24(4): 161–177. DOI: 10.1111/j.1365-2907.1994.tb00140.x.

Lozan, M., Belik, L. and Samarskii, S. 1990. *Dormice (Gliridae) of the south-west USSR*. Shtiintsa, Kishinev, USSR, 146.

Nowakowski, W.K. and Boratyñski, P. 2001. An attempt to estimate the size and density of *Dryomys nitedula* population in the Bialowieza forest. *Trak. Univ. J. Sci. Res. B*. 2 : 121–124.

Rossolimo, O.L., Potapova, E.G., Pavlinov, I.A., Kruskop, S.V. and Volcit, O.V. 2001. *Dormice (Myoxidae) of the world*. Publisher: Moscow Univ., Moscow, Russia, 229.

Scinski, M. and Borowski, Z. 2006. Home ranges, nest sites and population dynamics of the forest dormouse *Dryomys nitedula* (Pallas) in an oak-hornbeam forest: a live trapping and radio-tracking study. *Polish Journal of Ecology*. 54 (3) : 391–396.

Stubbe, M., Dawaa, N. and Dorz, S. 1985. Der Baumschlafer – *Dryomys nutedula* Pallas, 1778 – in der Mongolei. Wiss. Beitr. M.-Luther-Univ. Halle-Wittenberg. 22 : 17–25.

Uspensky, G.A. and Lozan, M.N. 1961. Some results of studying the ecology of dormice (Myoxidae) Moldavia. Issues of ecological and economic significance of terrestrial fauna. Kishinev, USSR, 75–84.

Yamashkin, A.A. 1998. *Physico-Geographical Conditions and Landscapes of Mordovia.* Publisher: Mordovia State University. Saransk, Russia, 156.